REMARKS

The Applicants respectfully request reconsideration in view of the foregoing amendments and following remarks. Upon entry of the present amendment, claims 1, 3-46 and 48-50 are pending. Claims 2 and 47 have been canceled without prejudice.

I. Rejections of Claims 1-50 Under 35 U.S.C. § 101.

In the Office action, the Examiner rejects claims 1-50 under 35 U.S.C. § 101 as being directed to non-statutory subject matter. Specifically, the Examiner writes, "a process consisting solely of mathematical operations without some claimed practical application is drawn to non-statutory subject matter. In this case, the claims merely recite 'outputting a bitstream'. Signals are not patentable." Office action, page 2. The Applicants respectfully disagree with the rejections of claims 1-50 and the Examiner's characterizations of the claims.

Independent claims 1, 17, 21, 24, 27, 31, 36, 42 and 49 are method claims, not "signal" claims. The method claims are directed to the performance of computer-implemented methods, not a signal encoding computer-executable instructions for software. Each of these independent method claims already recites a practical application of "encoding" media data or audio data. Each of these independent method claims also already recites a practical application of "outputting" a bitstream of media (or audio) data that had been encoded.

Nonetheless, to expedite prosecution, the Applicants have amended claim 1 to recite, "receiving a sequence of audio data," and amended each of claims 17, 21, 24, 27, 31, 36, 42, 49 to recite, "receiving a sequence of media data." The media (or audio) data are then encoded, producing a bitstream of encoded data that is output. Each of the independent claims -- now including an act of "receiving" data, an act of transformation (namely, "encoding"), and an act of outputting -- is limited to a practical application.

To expedite prosecution, the Applicants have also amended computer-readable medium dependent claims 16, 18, 22, 25, 28, 32, 37, 43 and 50. These dependent claims are now directed to "storage" media storing computer-executable instructions. These dependent claims are not "signal" claims.

The Examiner's rejections of claims 1-50 under 35 U.S.C. § 101 are moot in view of these changes.

II. Patentability of Claims 1-30 and 42-48.

In the Office action, the Examiner rejects claims 1-30 and 42-48 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 7,263,482 to Chen at al. ("Chen patent") in view of U.S. Patent No. 6,081,554 to Lee et al. ("Lee patent"). The Applicants respectfully disagree with the rejections of the claims, the Examiner's characterizations of the claims, and the Examiner's "Official Notice" of "encoding features."

A. Chen Patent

In the interest of reaching a shared understanding of the disclosure of the Chen patent, the Applicants make the following observations.

The Chen patent describes a variety of rate control strategies, including those in which an "audio encoder adjusts quantization of the audio information to satisfy constant or relatively constant bit rate [collectively, 'constant bitrate'] requirements, while reducing unnecessary variations in quality and ensuring that any necessary variations in quality are smooth over time." Chen patent, 8:25-30; *see also* 2:26-32 and 28:45-62. The Chen patent details various techniques that can be used in rate and quality control strategies.

In particular, the Chen patent describes a "future complexity estimator (410)" that "receives information about transient positions and strengths for the current frame as well as a few future frames. The future complexity estimator (410) estimates the complexity of the current and future frames, and provides a complexity estimates α_{future} to the target setter (430)." Chen patent, 16:4-9. The Chen patent continues:

> The future complexity estimator (410) estimates the complexities of the current and future frames in order to determine how many bits the encoder can responsibly spend encoding the current block. In general, if future audio information is complex, the encoder allocates fewer bits to the current block with increased quantization, saving the bits for the future. Conversely, if future audio information is simple, the encoder borrows bits from the future to get better quality for the current block with decreased quantization.
>
> The most direct way to determine the complexity of the current and future audio information is to encode the audio information. The controller (400) typically lacks the computational resources to encode for this purpose, however, so the future complexity estimator (410) uses an indirect mechanism to estimate the complexity of the current and future audio information. The number of future frames for which the future complexity estimator (410) estimates complexity is flexible (e.g., 4, 8, 16), and can be pre-determined or adaptively adjusted.

Chen patent, 16:62-17:14. The Chen patent also describes other approaches to future complexity estimation: "In alternative embodiments, the future complexity estimator (410) uses a direct technique (i.e., actual encoding, and complexity equals the product of achieved bits and achieved quality) or a different indirect technique to determine the complexity of samples to be coded in the future, potentially using parameters other than or in addition to the parameters given above." Chen patent, 18:22-28. The Chen patent does not mention the use of a trellis in encoding, however.

B. Lee Patent

In the interest of reaching a shared understanding of the disclosure of the Lee patent, the Applicants make the following observations.

The Lee patent describes "controlling the generated bit rate of compressed video information to keep within the maximum buffer capacity." Lee patent, Abstract. The Lee patent describes evaluating the effects on buffer utilization of using/not using different compression "shortcuts," using/not using arithmetic coding, and using/not using downsampling. *Id.*

In particular, the Lee patent states:

> Trellis-based buffered compression is a well known technique for effecting rate control in state of the art video compression algorithms such as MPEG-2. For example, A. Ortega et al., "Optimal Trellis-Based Buffered Compression And Fast Approximatios," IEEE Transactions On Image Processing, 3(1) 26-40 (1994) describes a technique to provide optimal buffer control for video sequences in a finite buffer environment. The problem of optimal buffered compression is defined as follows: Given a set of quantizers, a sequence of blocks to be quantized, and a finite buffer, select the optimal quantizer for each block so that the total cost measure is minimized and the finite buffer never overflows.

Lee patent, 6:41-53. The Applicants have located a copy of the Ortega reference and will submit a copy with an Information Disclosure Statement. The Lee patent continues by describing encoding of N blocks using M available quantizers to code each block, and tracking the results of the encoding in terms of rate and distortion. Lee patent, 6:54-65. The Lee patent describes choosing an "admissible solution" as a quantizer for each block that minimizes distortion (equation 8), subject to buffer occupancy constraints (equation 9). Lee patent, 6:66-7:28.

C. **Claims 1, 3-16 and 21-26**

Claim 1, as amended, recites, "pruning the trellis according to a cost function that considers smoothness of quality changes."

Claim 21, as amended, recites, "pruning the trellis according to a cost function that considers smoothness in quality changes as well as quality according to noise to excitation ratio."

Claim 24, as amended, recites, "pruning the trellis according to a cost function that considers both quality and smoothness in quality changes."

The Lee patent and the Chen patent, taken separately or in combination, fail to teach or suggest the above-cited language of claim 1, 21 and 24, respectively.

The Examiner acknowledges that the Chen patent "does not specifically show encoding a sequence of media data using a trellis." Office action, page 3. The Applicants agree and note that the Chen patent is even further from teaching or suggesting "pruning" a trellis or pruning a trellis according to a cost function that considers "smoothness" of quality changes.

The Examiner later writes that the Chen patent shows a "cost function considers both quality and smoothness of quality changes." Office action, page 4. The Applicants respectfully disagree that the Chen patent shows a "cost function" as recited in the claims of the present application, where the cost function is used in "pruning" concurrently tracked encoding decisions during encoding as claimed.

The Examiner also writes that the Lee patent shows "that it is well known to use trellis in encoder coding." Office action, page 3. Although the Lee patent briefly describes trellis coding, it describes finding an "admissible solution" simply by selecting quantizers that minimize distortion. Lee patent, 6:66-7:28. Selecting quantizers that minimize distortion when finding an "admissible solution" through N blocks represented in a trellis (as in the Lee patent) is different than, and leads away from, "a cost function that considers smoothness of quality changes" (as recited in claim 1), "a cost function that considers smoothness in quality changes as well as quality according to noise to excitation ratio" (as recited in claim 21) and "a cost function that considers both quality and smoothness in quality changes" (as recited in claim 24).

Claims 1, 21 and 24 should therefore be allowable. Each of dependent claims 3-16, 22, 23, 25 and 26 includes the above-cited language of claim 1, 21 or 24, and, for at least that reason, should also be allowable. The Applicants will not belabor the merits of the separate patentability of these dependent claims.

D. Claims 17-20

Claim 17, as amended, recites:

> in a first pass, encoding the sequence of media data using a trellis to determine a trace through the sequence of media data, wherein the media data includes plural portions, and wherein the trace includes a determination of a quality level for each of the plural portions of the media data;
>
> in a second pass, encoding the sequence of media data along the trace to produce an output a bitstream of the encoded media data at constant or relatively constant bitrate.

The Lee patent and the Chen patent, taken separately or in combination, fail to teach or suggest the above-cited language of claim 17. The Examiner does not specifically address the language of claim 17 in the Office action.

The Examiner acknowledges that the Chen patent does not show "two-pass encoding, latency windows, or delayed decision encoding" but takes the position that "one of ordinary skill in the art would know how to add these encoding features." Office action, page 4. Even if, for the sake of argument, two-pass encoding was generally known in the art, there is no teaching or suggestion in the Chen patent, Lee patent, or elsewhere to use two-pass encoding in which a trellis is used in a first pass "to determine a trace" and the encoding in the second pass is "along the trace" (as recited in claim 17).

Claim 17 should therefore be allowable. Each of dependent claims 18-20 includes the above-cited language of claim 17 and, for at least that reason, should also be allowable. The Applicants will not belabor the merits of the separate patentability of dependent claims 18-20.

E. Claims 27-30, 42-46 and 48

Claim 27, as amended, recites, "wherein the encoding uses a trellis with plural nodes based upon quantization of buffer fullness levels, and wherein the quantization of the buffer fullness levels is adaptive during the encoding."

Claim 42, as amended, recites, "wherein the trellis includes plural nodes based upon quantization of buffer fullness levels, and wherein the quantization of the buffer fullness levels is adaptive during the encoding."

The Lee patent and the Chen patent, taken separately or in combination, fail to teach or suggest the above-cited language of claims 27 and 42, respectively.

The Examiner acknowledges that the Chen patent "does not specifically show encoding a sequence of media data using a trellis which includes plural nodes based upon quantization of buffer fullness levels." Office action, page 3. The Applicants agree and note that the Chen patent is even further from teaching or suggesting a trellis including nodes based upon quantization of buffer fullness levels where the "quantization of the buffer fullness levels is adaptive during the encoding" (as recited in claims 27 and 42, respectively).

The Examiner writes, however, that the Lee patent shows "that it is well known to use trellis in encoder coding." Office action, page 3. Although the Lee patent briefly describes trellis coding, it describes tracking rate and distortion for different blocks and quantizers. Lee patent, 6:66-7:28. Tracking rate and distortion for blocks represented in a trellis (as in the Lee patent) is different than, and leads away from, a trellis that includes "nodes based upon quantization of buffer fullness levels" (as in claims 27 and 42, respectively). Although the Lee patent also describes tracking buffer occupancy at different stages so as to check buffer occupancy against buffer size B_{max}, this does not relate to how nodes of the trellis are defined. The Lee patent is even further from teaching or suggesting "nodes based upon quantization of buffer fullness levels" where the "quantization of the buffer fullness levels is adaptive during the encoding" (as recited in claims 27 and 42, respectively).

Claims 27 and 42 should therefore be allowable. Each of dependent claims 28-30, 43-46 and 48 includes the above-cited language of claim 27 or 42 and, for at least that reason, should also be allowable. The Applicants will not belabor the merits of the separate patentability of these dependent claims.

III. Patentability of Claims 31-41.

In the Office action, the Examiner presents no prior art rejections of claims 31-41. Claims 31-41 should be allowable.

IV. Patentability of Claims 49 and 50.

In the Office action, the Examiner rejects claims 49 and 50 under 35 U.S.C. § 103(a) as being unpatentable over the Chen patent in view of U.S. Patent No. 6,937,770 to Oguz et al. ("Oguz patent"). The Applicants respectfully disagree with the rejections of the claims.

Claim 49, as amended, recites, "checking whether the encoding has succeeded and, if the encoding has not succeeded, performing one-pass encoding of at least part of the sequence."

The Oguz patent and the Chen patent, taken separately or in combination, fail to teach or suggest the above-cited language of claim 49.

The Examiner acknowledges that the Chen patent does not "specifically show two pass encoding or delayed decision encoding" but states that the Oguz patent "includes two-pass encoding." Office action, pages 4-5. Even if, for the sake of argument, the Oguz patent describes two-pass encoding and the Chen patent describes one-pass encoding, neither the Chen patent nor the Oguz patent teaches or suggests checking whether two-pass encoding has succeeded and, if not, performing one-pass encoding, as recited in claim 49.

Claim 49 should be allowable. Dependent claim 50 includes the above-cited language of claim 49 and, for at least that reason, should also be allowable.

V. Conclusion.

Claims 1, 3-46 and 48-50 should be allowable. Such action is respectfully requested. The Examiner is invited to call the undersigned attorney at the telephone number below if the Examiner believes that doing so would further the prosecution of the present application.

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